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# Health and Policy: The Impact of Health Information on Restaurant Menus on Ordering Behavior

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Health and Policy:

The Impact of Health Information on Restaurant Menus on Ordering Behavior

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## Abstract

Two studies examined the effect of nutritional information on restaurant menus on ordering behavior, with contradictory results. With the hypothesis that participants given health information would select items with fewer calories than those given no health information, participants (n= 54) were first given one of three different menus: one containing no nutritional information, a second disclosing calories, and a third containing a simplified traffic light system indicating the healthiness of each item. Participants then “ordered dinner” followed by demographic surveys. Women and participants with a lower BMI ordered fewer calories when given health information, while men and participants with higher BMI ordered more calories when given health information. The second study (n=89) repeated the ordering exercise from the first, followed by a questionnaire testing the hypothesis that participants that were more interested in tasty foods over healthy foods would order more calories when health information was present. Though the BMI effect was not replicated, the gender trend remained when taking into account health and taste preferences. Further research needs to be conducted to determine the implications and reasons for these results, and their potential impact on public health as calories are mandated on restaurant menus nationally.

### Health and Policy: The Impact of Health Information on Ordering Behavior

The increasing rate of obesity in the United States has heightened interest in the topics of public health, education, and knowledge. With two out of three Americans overweight and childhood obesity on the rise, the U.S. has seen a dramatic increase in heart disease, diabetes, hypertension, and obesity-related deaths in recent years (Mokdad et al., 2003; FDA, 2010). With obesity-related health care costs increasing to \$147 billion a year (FDA, 2010), the obesity epidemic now impacts all American citizens, not just those individuals that are overweight. To help alleviate this problem, the government has been seeking effective policies to reduce over-consumption.

In an attempt to combat obesity, the recent health care reform bill includes a section requiring food chains with twenty or more locations to post caloric information on their menus (Stein, 2010; Rosenbloom, 2010). The goal of this policy is to inform consumers about what they are eating when outside the home with the hope that it will decrease the amount of junk food consumed (Stein, 2010). This research questions whether the health care reform bill will be effective in battling obesity, which specific populations it may be effective for, and whether it is the best approach to decrease unhealthy eating behavior.

In review of past governmental efforts to provide education to consumers, the Nutrition Labeling and Education Act of 1990 was the first step in the process of requiring food manufacturers to display nutritional information on packaged foods. Labels are now required to reveal caloric content, along with other nutrients related to disease and obesity. Surveys testing the effectiveness of nutrition labeling have shown that those interested in a low-fat diet and who understand the correlation between diet and chronic disease are significantly more likely to utilize the information (Neuhouser, Kristal, & Patterson, 1999). Also, consumers often underestimate and are confused by misleading serving size information when tracking their daily

calorie intake through nutrition labeling (Lando & Labiner-Wolfe, 2007). Although this measure was effective for some demographics, there have been mixed results regarding its success overall (Stein, 2010; Roberto, Schwartz, & Brownell, 2009), and it is clear that other policies also need to be implemented for a more comprehensive and widespread effect.

With the obesity trend continuing to increase, the next logical step by the government to counteract this problem would be to implement these nutritional policies not only to the manufacturers of the food we eat at home but also to the businesses and corporations that serve them outside the home. Research has shown that Americans consume 20% of their meals and over 34% of their calories outside the home, often consuming up to 800 excess calories a day when eating out (Berman & Lavizzo-Mourey, 2008). Two other studies study provide evidence that it is more difficult to estimate the calories in restaurant meals (even by trained nutritionists), especially with the evolution of larger portion sizes and higher general caloric content (Roberto et al., 2009; Burton, Creyer, Kees, & Huggins, 2006). Therefore, the next logical place to look for an obesity solution may be the restaurants where these foods are consumed.

Ordering behaviors can potentially be impacted by the availability of information. Consumer research has shown strong interest in readily available nutrition information when ordering at restaurants (Lando & Labiner-Wolfe, 2007; Roberto et al., 2009; Richard, O'Loughlin, Masson, & Devost, 1999). Furthermore, there has been wary interest in easily-identifiable symbols for healthful meal choices, provided that there is a standardized format and reliable guideline for symbol usage (Lando & Labiner-Wolfe, 2007; FDA, 2010). Nonetheless, some consumers appreciate the information, but admit that they would not utilize it in every situation (Lando & Labiner-Wolfe, 2007).

In hopes to encourage and support healthier decision-making while dining, the Patient Protection and Affordable Healthcare Act passed by the U.S. Congress in 2010 includes a section

mandating that national restaurant chains and food establishments with 20 or more locations post the calorie information of their offerings at the point of purchase, with more health-related information available upon request (Stein, 2010). As the exact logistics of this mandate are currently being determined by the FDA to be released in March 2011, the best way to implement this policy for the most effective result is currently one of the hottest topics in the health and nutrition community. Roberto et al. (2009) argue that providing the information will be very helpful, especially if combined with an explanation of how to utilize the information. Blumenthal and Volpp (2010) claim that the new policy will likely have little effect on behavior, as the true problem is self-control, not lack of information, and many people do not understand how to use the information anyway. A health impact assessment conducted by Kuo, Jarosz, Simon, and Fielding (2009) concluded that if only 10% of restaurant patrons utilize the information and order fewer calories, there will be a very sizable impact on the obesity epidemic and public weight gain. Note, however, that this assessment only assumes either a positive impact or no difference in behavior.

There have been mixed results in research concerning the effectiveness of nutrition information in decreasing unhealthy eating behavior. The famous “McSubway Study” conducted by Wansink and Chandon (2007) found that the availability of nutrition information does not always have a positive effect on healthy eating behavior. In fact, participants eating at a restaurant providing no health information (McDonald's) were more accurately able to predict the calories they had consumed over participants eating at a restaurant offering some nutritional information (Subway). The authors attributed this difference to the halo effect, wherein Subway's offering and promotion of select healthy menu items attributed to participants' belief that all Subway items were good for them and caused the participants from Subway to think that they were eating healthier than they actually were and to overeat. In conjunction with another article

by Wansink about unconscious eating behaviors (2010), the authors argue that nutrition information will have little impact compared to other factors (plate size, packaging, lighting, color, convenience, layout, etc.) when ordering/eating out.

Several other studies have attempted to test the correlation between availability of information and consumption behaviors with mixed results (Stein, 2010; Harnack & French, 2008; Roberto et al., 2009). Kral, Roe, and Rolls (2002) found that participants ate the same amount whether they knew a foods' caloric density or not. Others have found that although there may be an effect, it may only be prominent for certain demographics (most notably, the health conscious and middle-aged) (Richard et al., 1999). In a review of six studies on this topic, Harnack and French (2008) concluded that while there was an effect in most of the studies, it was generally weak and inconsistent.

However, some studies have shown positive results regarding nutritional information and purchase/consumption decisions. In a college cafeteria, Chu, Frongillo, Jones, and Kaye (2009) measured a steep decline in caloric content of foods purchased when information was posted at the point of purchase (as well as a steady incline when the information was removed). However, interestingly, overall retail sales did not decline, indicating there was no cost to the store's sales for posting the information. Burton et al. (2006) also found that nutrition information on unhealthy foods decreased participants' intention of ordering them. In a recent study, Roberto, Larsen, Agnew, Baik, and Brownell (2010) tested ordering and consumption behaviors involving three types of menus: one with no information, another with calorie information, and a third with calorie information and a statement of the recommended daily intake of calories. They found that both information conditions had a significant impact on ordering and consumption behaviors, such that those given nutritional information ordered fewer calories overall. Furthermore, those that were also given recommended daily intake information ate far fewer calories for the rest of

the day than did those in the other two conditions, indicating the importance of an understanding of context in relation to numeric caloric facts. After the law mandating New York restaurants to post calorie information went into effect, Dumanovsky, Huang, Bassett, and Silver (2010) measured customer response to the new information and found that awareness/noticing of the health information rose dramatically, and 27% of consumers claimed the information affected their eating choice.

Furthermore, there is evidence that easily identifiable symbols conveying health information could be effective in reducing consumption and informing those without a nutritional background. Allen, Taylor, and Kuiper (2007) found that a 30-minute nutritional training program leads to far healthier ordering decisions post-intervention, indicating the importance of an understanding of context for nutritional information to be helpful. Studies conducted by Richard et al. (1999) and Kozup, Creyer, and Burton (2003) found that consumption and positive attitude toward healthy menu items increased when these items were labeled as healthy and clearly advertised. Both Roberto et al. (2009) and Blumenthal and Volpp (2010) indicate that menu labeling can potentially be effective, but only if implemented in ways that are easily understandable to the general public, such as intuitive symbols. To measure the impact of one potentially useful symbol system for conveying health information intuitively, the current study will measure the impact of a traffic light symbol system similar to that which is used in the United Kingdom to indicate the health levels of food products (FSA, 2010).

With this lack of clarity about the effectiveness of nutritional information impacting consumption, the question arises of which method of presenting health-related information best attains the desired result. With several options for providing information to consumers, our study will attempt to determine which style presented on a restaurant menu leads to the most healthful ordering decisions. Participants will be given one of three possible menu types, including one



with no caloric information, one with the caloric content of each item, and one with a traffic light symbol system indicating good, cautious, and bad caloric choices. Participants will order from these menus as if they were eating at this restaurant for dinner. Total number of calories ordered by participants individually from each menu condition will then be calculated. The prediction is that easily interpretable symbols will be the most effective in encouraging healthier ordering, followed by the presentation of nutritional information, followed by no information. Therefore, participants given the traffic light menu will order fewer calories than participants given the menu containing calorie information, followed by participants given no information. Also, an analysis of demographic information will be done in conjunction with ordering behavior to determine if there are any effects exhibited by specific populations.

### Study 1: Method

#### *Participants*

Sixty undergraduate students at the University of Colorado at Boulder participated voluntarily in this study. Subjects were approached around several places on campus and asked to participate. Of the 60 original participants, 54 of the participants (35 females and 19 males) were included in the data analysis. Six were removed because they did not follow the directions correctly. The control group had 17 participants, the calorie group had 19, and the traffic light group had 18, totaling 54 participants. Participant ethnicity was as follows: 46 Caucasians, 1 African American, 1 Asian, and 6 Hispanics. Participants received no payment or reward for participating in this study.

#### *Materials*

To study the effects of health information on food choice/total calories consumed, three different restaurant menus were created. The menus consisted of select food items from Chili's restaurant representing a wide range of caloric contents and types of dishes. Chili's was chosen

due to its national popularity, wide selection, and readily available caloric information. The constructed menus appeared to be takeout menus from a fictitious “Harry’s American Bistro” to disguise the original source.

All three menus consisted of the same content (appetizers, soups/salads, entrees, desserts, and drinks) including menu options and design. The only variable that changed between menus was the health information. In Menu 1 (the control condition), menu items and their ingredients were included as seen in most restaurants, with no further health information. Menu 2 (the calorie condition) contained all the same elements as Menu 1 plus the number of calories placed beside each menu option. Menu 3 (the lights condition) was also the same as Menu 1 plus it included a traffic light system that indicated the health level of each menu option. For Menu 3, the stoplight colors green, yellow, and red indicated good, cautious, or bad health ratings for each item based on its caloric content. Lights were explained in a key prominently displayed on this menu reading: “Red= This food is high in calories. It is fine to have this food occasionally, but try eating it in smaller amounts. Yellow= This food isn’t high or low in calories, so this is an okay choice most of the time. Green= This food is low in calories. The more green lights, the healthier the choices.” The calorie range for lights was: Green 0-500 calories, Yellow 500-1000 calories, and Red 1000+ calories. These ranges were chosen based on the proportion of calories each dish represented in relation to the 2000 calorie daily intake standard.

A demographic survey was also included which asked each participant’s gender, height and weight (later converted to a BMI score), race, and two additional questions ranked on a 10-point scale. One question asked participants how satisfied they were with their body, with 10 being the most satisfied. The second question asked participants how committed they were to sustaining a healthy lifestyle, with 10 being the most committed. The demographic survey

questions were chosen to examine if there were any additional relationships between caloric choices and the demographic information of participants.

### *Procedure*

The participants were randomly assigned to three groups: a control group with no calories included on the menu, one having calories on the menu, and the third having a traffic light symbol system that correlated to how many calories are in each food item. After securing consent, the experimenters gave the participants a manila envelope containing directions for the experiment, along with one of the three menus and the demographic survey. The materials were given in an envelope so that the experimenter would be unaware of the participant's condition, reducing experimenter bias. The participants were informed that the study was for a market research class studying food preferences at a local restaurant in order to decrease demand characteristics. The participants were told in the directions to circle the food items on the menu that they would order if they were eating dinner in this restaurant. After picking their food preferences, participants were instructed to complete the demographic survey. After completing the survey all materials were put back in the envelope and sealed to preserve confidentiality. The participants were then debriefed and dismissed.

### *Results*

To determine whether participants with different menus indeed ordered different amounts of calories, a one-way ANOVA comparing the average number of calories ordered from the control ( $M=1863$ ,  $SD=821$ ), calorie ( $M=1766$ ,  $SD=799$ ), and traffic light ( $M=1861$ ,  $SD=921$ ) menus was conducted (See Figure 1). The results of this test were not significant,  $F(2,51)=.08$ ,  $p=.92$ . Contrary to our hypothesis, there was no main difference in the number of calories ordered whether the participants were given no information, caloric content, or traffic light

symbols.

However, an analysis of demographic information in relation to ordering by menu type revealed two notable interaction effects. While there was no main effect of gender on number of calories ordered (for males,  $M=1978$ ,  $SD=841$ ; for females,  $M=1747$ ,  $SD=831$ ) ( $t(52)=-0.97$ ,  $p=.34$ ), when crossed with menu condition, there was a much different result. As shown in Figure 2, there was a trend wherein women had the predicted effect of ordering fewer calories when health information was present on the menu. Men, however, ordered more calories when caloric information was available ( $t(48)=1.82$ ,  $p=.07$ ).

Furthermore, there was a significant correlation of calories ordered by menu type depending on Body Mass Index score (BMI, or weight classification). As shown in Figure 3, participants with a lower BMI (those with a lower weight than average) ordered as predicted, using the health information included on menus to order fewer calories. However, in this crossover interaction, participants with a higher BMI (those with a higher weight than average) actually ordered more calories when that information was included ( $t(48)=2.18$ ,  $p=.03$ ). Other factors that did not show significance in relation to calories ordered included level of commitment to a healthy lifestyle ( $r(52)=.11$ ,  $p=.42$ ) and level of satisfaction with one's body ( $r(52)=.14$ ,  $p=.31$ ).

## Discussion

The first study attempted to find a difference in the way caloric content is presented on restaurant menus and how that impacts ordering behavior. Participants were given one of three possible menus that contained either no caloric content, caloric content, or a traffic light symbolizing the amount of calories next to each food item. Then the total number of calories was calculated for each participant based on the food items they chose from the menu. The hypothesis was that symbols relaying the healthiness of food items would result in the fewest amount of

calories ordered, followed by the awareness of caloric information, followed by no nutritional information. The data showed no significant differences in number of calories ordered by menu type. However, there were two demographic factors that seemed to impact the number of calories participants ordered with a given menu, gender and BMI. To better understand these results and to hypothesize a possible explanation for them, I will return to a review of the literature before introducing a second study exploring these correlations.

Perhaps surprisingly, many of the studies cited earlier in this paper that have previously studied nutritional information and eating behaviors do not gather or analyze any demographic factors (gender, age, BMI, etc.) when disclosing their results (Kuo et al., 2009; Burton et al., 2006; Roberto et al, 2010; Harnack & French, 2008; Chu et al., 2009; Stein, 2010). With that approach to this initial study, it would have seemed that the nutritional information manipulation had no impact. In fact, when taking into account demographic variables such as gender and BMI, there were actually two crossover effects. This study reveals a large potential flaw and limitation in the design of several of the most highly cited studies discussed in relation to the restaurant menu health information legislation.

Many other studies have been conducted examining the relationship of gender and eating behaviors, and not surprisingly, several of them have found differences in what and how much males and females consume. Bates et al. (2009) found that when trying to estimate the number of calories in various foods and their purchase intentions for those foods, women were more accurate than men (though all had trouble with accuracy for the highest-calorie items) in estimations, and ordered fewer calories whether the calorie information was present or not. Men only reduced their caloric purchase intentions when the calorie information was available to them. When tracking the awareness and utilization of nutritional information on consumers' choices in a New York fast food restaurant, Dumanovsky et al. (2010) found that women noticed

the information equally, but actually used it less in making their selections. In another study, when asked about their attitudes toward high-fat versus low-fat foods, participants showed higher preference for low-fat foods overall, but women were much stronger in their opinion than men (Stafleu et al., 1994).

Two naturalistic observations conducted in university cafeterias also had interesting gender-related results in eating patterns. In one study, men's calorie choices were not affected by the number/presence of women in their group, while women consumed fewer calories with men present (especially more than one). Furthermore, women sometimes consumed more calories than usual if only women were present (Young et al., 2009). In the other, Blackman, Singer, and Mertz (1983) observed that men purchased more calories than women overall, with no differences among weight categories. There was however a weight distinction among women wherein heavier women bought more calories than other women. Two more studies only including women found that both health and taste are more important than other factors when making food selections (Lindeman & Stark, 1999) and that consumption was the same among two groups of women whether they were presented with the caloric content of their meals or not (Kral et al., 2002). Thus, the research concerning gender and eating behaviors has found much significant, though not necessarily consistent, information.

Regarding Body Mass Index and weight classifications, very little research has been done looking specifically at these ranges in populations and their behaviors given health information on restaurant menus. Some studies have found very little or no difference in weight classes when making food selections (Stafleu et al., 1994; Blackman et al., 1983). Another study looking at men in particular found that larger men with a higher fat intake had substantially more negative attitudes toward reducing fat consumption than their lower intake counterparts, concluding that motivation and attitude may be more important than availability of health information in

impacting dietary choices (Packman & Kirk, 2000). Overall, though the topics of obesity and eating disorders both have large foundations of individual and specific research, few studies have been conducted taking into account the ranges of weight classes and variations in food selections for the general population at large.

Turning to one possible explanation for the differences found between men and women, and lower and higher weight people, when making ordering choices, there is a vast amount of research examining the relationship of preferences for healthy and/or tasty foods when making eating decisions. Glaz et al. (1998) asked American consumers to rate the elements that were most important to them when choosing a food, reporting that taste and cost outweighed other factors including nutrition, convenience, and weight control. However, women were more concerned with taste, nutrition, and weight control than men were. In London, a Food Choice Questionnaire was developed to determine people's motives and values when making eating decisions, with BMI having no relationship to preferences, but women were found to value taste, health, and weight control as more important than men (Steptoe, Pollard, & Ward, 1995).

Another measure developed in Europe took into account the distinct and somewhat contradictory elements of health and taste in people's food decisions. The Health and Taste Questionnaire was created through a factor analysis determining three subsets in each category, including healthiness, light foods, and natural foods under "Health", and craving sweets, food as reward, and pleasure under "Taste" (Roininen, Lahteenmaki, & Tuorila, 1999). The measure shows women to be more interested in health and taste than men, while younger people are more interested in taste and older people are more interested in health. Again, no weight distinctions were found. This measure earned further validity in another study asking participants to choose either an apple or chocolate bar as a snack, and comparing their choice with their questionnaire results and general dietary habits (Roininen & Tuorila, 1999).

Revisiting the use of symbols, and specifically the red traffic light to indicate unhealthy menu choices, some prior research has examined reactivity and the effect of forbidden foods on desire for consumption. One study labeled certain target foods as prohibited “red foods” for one group in a kindergarten cafeteria setting (Jansen, Mulkens, & Jansen, 2007). Children in the prohibition condition rated the red foods as more desirable than other children, and consumed more of the forbidden target food after restrictions were lifted. Furthermore, children who had higher or lower restrictions in their homes ate more overall calories than those with moderate restrictions. In another study, cream cheeses with varying fat levels were presented to participants with either no labels, calorie labels, or calorie labels accompanied with a surgeon general warning cautioning participants away from the full-fat cream cheese (Bushman, 1998). Although participants in both information groups chose the non-fat cream cheese to eat most often, those in the warning condition rated the full-fat cream cheese to be the most desirable, indicating the power of warning labels in creating greater desire for forbidden foods.

With this research filling in some of the holes of the initial study, a second study design tackled the question of why different genders and BMI scores exhibit different ordering behaviors when given health information. This second study first and foremost attempted to replicate the findings of the first experiment to increase reliability of these effects with a larger, more randomly selected sample. Second, a follow-up questionnaire was included to gather further information about people's choices, most specifically their attitudes toward a “health-taste trade-off”, and what was important to them in making the decisions they did. Considering the BMI results of the first study, wherein those in higher weight classes ordered more calories when given calorie and health information, the hypothesis in the second study is that those with higher BMI scores will also value tastiness over health when making ordering decisions. With the belief that higher calorie food choices taste better, they are more likely to order more calories when



given health information on restaurant menus.

## Study 2: Method

### *Participants*

Ninety-three undergraduates from University of Colorado at Boulder voluntarily participated in the second experiment in exchange for course credit (using the Psychology Department subject pool). Of the original 93 participants, 89 participants (44 males, 45 females) were included in data analysis. Four were removed for not following directions correctly or failing to provide relevant information. Age ranged from 18 to 36, and ethnicity was as follows: 70 Caucasians, 3 Hispanics/Latinos, 5 Asian Americans, 2 Native Americans, and 9 “Other or Mixed”. The control menu group had 29 participants, the calorie menu group had 30 participants, and the traffic light menu group had 30 participants. Body Mass Index Scores for participants ranged from 16.7 to 36.5, with a mean of 22.8, and a standard deviation of 3.4.

### *Materials*

The same three takeout menus from the fictitious “Harry's American Bistro” were used again in the second study. One included no health information, one displayed calories next to each item, and the third utilized the traffic light symbols to indicate the health level of each item with a red, yellow, or green stoplight corresponding to the number of calories in each dish.

In the second study, participants answered a series of questions using a Qualtrics electronic questionnaire on the computer. Participants were first asked questions about how pleased they were with the menu in terms of selection and variety, how likely they would be to go to this restaurant, both how healthy and tasty they thought their choices would be, as well as asked to estimate the number of calories they had ordered. These questions support the cover story about market research, and also provide an understanding of the participants' opinion about health and taste levels of their choices, and how accurately they can predict their actual calories

ordered.

The next section asked two straightforward questions forcing subjects to choose between two undefined dishes with differing health contents. The first question asked, “Given the choice between a meal containing 600 calories and another meal containing 900 calories, which would you be more likely to order?”, followed by a short answer field asking, “Why?” to gather some qualitative data in the participants' own words. The second question presented was, “Suppose there was a restaurant menu with health symbols next to each item indicating it's level of healthiness with a red light, yellow light, or green light. Given the choice between an entree with a red light or an entree with a green light, which would you be more likely to order?” along with the two pictures of the health symbols in the response set. This was also followed with a “Why?” field to gather qualitative data before the participants entered the “health versus taste” question section.

The third section asked participants to indicate their level of agreement with several statements with forward and reverse-coding regarding the health versus taste trade-off and their interest in eating healthy/delicious food when eating out. Five questions, such as “Meals that are considered 'healthy' generally don't taste as good as regular meals.” and “I think healthy foods generally taste better than foods with a lot of calories.” (R-coded) were averaged to provide a mean “health vs. taste” score for each participant, with lower scores (closer to 1) being in less agreement with the tradeoff and less interested in eating foods with a lot of calories, and higher scores (closer to 5) being in more agreement that fatty foods taste better.

Finally, a demographic survey was given at the end of the session. Participants were asked to give their gender, age, ethnicity, height, and weight. The height and weight information was later used to determine each participant's BMI score using a conversion formula.

### *Procedure*

The second experiment was conducted in a basement computer lab of the Muenzinger building. Up to six participants were run at a time, each in their own sub-room with a computer. Participants were brought in, read and signed the consent form, and were given instructions as a group. Participants were told the session was part of market research for a local restaurant in Boulder, and they were interested in people's food preferences and ordering decisions. Subjects were then asked to enter a lab room, where there would be a takeout menu awaiting them. They were to read over the menu completely, then circle the items they would like to order if they were visiting this restaurant for dinner one night. After they had completed filling out the menu, they gave it to the experimenter, and began the short computer survey. They were then debriefed and dismissed.

### Study 2: Results

To begin with an analysis of the main effect of menu type on number of calories ordered, again there was no difference among conditions on total calories ( $F(2,86)=1.52, p=.22$ ); however the plot of the data does look a bit different than that of the first experiment (see Figure 4), and the data was trending a difference between the control condition ( $M=2647, SD=931$ ) and the lights condition ( $M=2186, SD=1058$ ) ( $t(2,86)=-1.7, p=.08$ ). There was a main effect of gender such that women ordered an average of 483 fewer calories than men overall ( $t(86)=-2.26, p=.03$ ). When looking at the interaction of gender and menu type on number of calories ordered, the lines of the graph look very different (see Figure 5), but in fact the differences are not statistically significant ( $t(82)=-1.29, p=.20$ ). There was a significant difference only in the lights menu condition, wherein women ( $M=1786, SD=952$ ) ordered far fewer calories than men ( $M=2647, SD=1045$ ) ( $t(87)=2.32, p=.03$ ). Gender was, unfortunately, not balanced among conditions, with men making up only 33% of the control condition, but 67% of the calorie menu condition, while the lights condition was balanced evenly (14 men, 15 women).

As for Body Mass Index scores, there was no main effect correlation of BMI in relation to calories ordered ( $t(87)=.34, p=.74$ ). Contrary to the hypothesis, and the results of the first study, menu condition had no influence on calories ordered depending on BMI level ( $F(5,83)=.64, p=.67$ ). As shown in Figure 6, Body Mass Index showed little connection to the number of calories participants ordered, whether taking into account menu type or not.

Although the two effects of the first study were not replicated in the second experiment, the extra data gathered in the added questionnaire participants filled out after ordering did provide some insight and extraneous interesting information. One very obvious effect of the calorie menu information on participants was their ability to accurately predict the number of calories they ordered in comparison to the other conditions (see Figure 7) ( $t(5,83)=2.91, p=.004$ ). This shows that although the menu does not generally affect the way people order, participants were aware of the number of calories they were ordering, and the information was not going unnoticed even if it wasn't actually changing their ordering behavior.

Before participants completed the section of the questionnaire asking about their attitudes toward healthiness and taste when it comes to choosing foods, they were simply asked to choose between a hypothetical 600 or 900 calorie meal (and to explain their choice), and then to choose between a fictitious meal with either a red light or green light symbol indicating the level of healthiness of the menu item (and to explain that choice). In this section, 44 participants (49%) chose the lower calorie menu option, while 45 (51%) chose the higher calorie option. However, when asked to choose between an entree with a red light and an entree with a green light, only 23 participants (26%) chose the red-light option, while 66 (74%) chose the green-light option.

Though this is only qualitative data analyzed by one person (with no comparison gauging interrater reliability), participants' responses explaining why they chose the red or green option often supported the theory of choice between health and taste. 52% of those choosing the red

light option mentioned “taste” or “flavor” in their response. Another 22% mentioned that eating out was a special occasion and they were not worried about the healthiness of their choices. The last category, making up another 22% of responses in the red category, were those that were attracted to the red food because it seemed to be “forbidden” or to pose a “challenge”. Of those that chose the green light entree, 55% explained their choice by saying it was “healthier” or “better for me”. Another 42% claimed that red seemed to mean “bad”, and green is generally “good”, so they were attracted to that choice. These results support the hypothesis that taste and level of healthiness are two important factors taken into consideration when making a choice between two foods. This qualitative data also supports the hypothesis that traffic light symbols evoke more of a visceral reaction when two options are being weighed.

Finally, after gathering participants' level of agreement with several statements regarding the trade-off of health and taste when considering foods to eat, each person's responses were averaged to determine their “Health versus Taste” score ranging from one to five, with higher scores indicating greater agreement that foods with more calories taste better. The average score on this scale (heretofore referenced as HvsT) was 3.24, with females having a lower score than men by an average of .5 points ( $t(85) = -2.63, p = .01$ ). Contrary to the hypothesis, BMI was not correlated with HvsT score ( $t(86) = -1.11, p = .27$ ). The HvsT variable does account for much of the variance in the data. When HvsT is held constant, gender has a marginally significant trend predicting a 393 calorie drop for females ( $t(82) = -1.83, p = .07$ ). Holding gender and HVST constant, being in the calorie menu condition predicts a 517 calorie drop ( $t(82) = -2.04, p = .04$ ) in calories ordered, while being in the traffic light menu condition predicts a 739 calorie drop ( $t(82) = -2.88, p = .01$ ).

The health versus taste score also revealed an interesting three-way interaction with BMI and gender ( $t(79) = -2.34, p = .02$ ). Figures 8 and 9 show the male and female graphs, respectively,

and how many calories each ordered, depending on their BMI score and HvsT score. In Figure 8, the men had the predicted effect, showing that those with higher HvsT score as well as a higher BMI did in fact order more calories. In Figure 9, the ladies show the opposite effect.

Interestingly, those with a higher BMI but *lower* HvsT score ordered more calories than those with a higher HvsT score. Also, those with a lower BMI and higher HvsT score ordered more calories than those with a lower BMI and lower HvsT score. Thus, while the data from the second study do not fully support the results found in the first study, several new interesting elements were revealed leading to further questions.

### Discussion

The first study attempted to measure the impact of health information, whether in the form of calories or health symbols next to food items, on ordering behavior. The data from study one showed that this information is not received equally by everyone, and demographic factors also have some influence. Women and people with a lower Body Mass Index score (meaning lower weight class) tended to utilize the information when available in order to choose fewer-calorie food options. Men and people with a higher BMI, however, actually used calorie and health information to order more calories when available.

These results informed the design of the second study which tried to replicate the results of the first with a larger sample, as well as introduce a theoretical mechanism explaining why these effects arise. So, the second study had participants again order from a restaurant menu with either no information, calories, or traffic light symbols next to each item indicating the level of calories in the dish. After this task, participants filled out a questionnaire asking about their eating preferences and level of agreement with the idea that higher calorie foods taste better and that they are more interesting in eating those (then averaged as their Health vs. Taste score).

The data from the second study failed to replicate the gender and BMI effects seen in the

first study. Women do consistently order fewer calories than men, no matter what menu they are given, though especially when given the traffic light menu. HvsT score also accounts for much of the variance in ordering, as gender and menu condition variables both have stronger effects when HvsT is held constant. A perplexing three-way interaction was also found in the second study involving gender, BMI, and HvsT score. For men, those with a lower HvsT score ordered fewer calories as BMI increased. For women, those with a lower HvsT score ordered more calories as BMI increased. The lack of consistency in the data between these two studies leads to a discussion of the limitations and alternative explanations of this research, as well as implications and suggestions for future research.

When running participants for these studies, time of day was not held constant, and level of hunger was not accounted for or measured. This limitation implies that participants that had just eaten may have ordered quite differently than those that were extremely hungry. Also, not conducting this research during the dining hours of the evening may have impaired the mundane and experimental realism of the study and participants' ability to take it seriously and answer honestly.

In addition, another alternative explanation could be that the participants were not able to understand the menu given, such as what the symbols meant. Even though the symbols had a definition nearby, some of the participants could have been confused about the traffic light system because they had never seen it before. Also, when given the nutritional information on the menus, the participants could have also not truly understood what the calorie number represents in the larger context of a healthy diet. The nutritional information could have been seen as just a number and nothing else. Furthermore, without any ability to track actual consumption, we have no way of knowing whether those participants who knew the nutritional content of their choices may have chosen to consume less than the full portion once their meal arrived, as indicated

previously by Roberto et al. (2010).

Since the type of food consisted of mostly American food with a couple of Mexican dishes, the participants could have possibly not liked the food presented on the menu and therefore not ordered an adequate meal. Putting a larger variety of food types on a menu might present participants with more choices that appeal to them individually and allow them to approach the experiment like a real-world situation. Also, since the participants selected were college students, many of them likely have busy schedules that do not allow them the time to participate in a research experiment like this with their full attention. It is possible that participants did not take this survey seriously and were in a hurry to circle the items quickly to get on with their busy lives without actually reading and looking at the information given.

Since the experiments were not conducted in an actual restaurant, there is low mundane realism, affecting the external validity of the experiment and making it harder to generalize the results to a real life restaurant situation. Another threat to the external validity of the experiments is the use of non-probability sampling. All of the participants were from CU and live in or around the Boulder area, which generally promotes healthy eating. Finally, there was no test of construct validity of the HvsT scale, as the test itself did not incorporate items from any prior data or measures. While it holds face validity, there were no tests of predictive or convergent validity for this scale.

The somewhat contradictory results from these two studies have immediate implications for the implementation of mandatory health information on restaurant menus nationally, as proposed in the healthcare bill passed in 2010. Much like other research on this topic (Harnack & French, 2008; Stein, 2010), these studies show weak and inconsistent results that need further study before such a widespread policy is enforced. If, in fact, the results from the first study were replicated and found to be more consistent, this has serious implications about obesity and the



potential harm of including health information on menus, as it may actually exacerbate the problem for the populations that need it the most.

If a person is generally more interested in unhealthy food when eating out (as measured by the Health versus Taste Scale), this information implementation will likely have no impact (or reverse effect) on their ordering behavior, indicating that the larger problem lies in lack of motivation rather than lack of information. There is some indication that symbols indicating healthiness level would be welcomed over basic calorie information (Lando & Labiner-Wolfe, 2007; FDA, 2010), but the difference in this limited sample seems relatively inconsequential. Future research could examine the use of other types of symbols to convey information on restaurant menus, even in conjunction with the presentation of calorie information, for a cumulative effect.

Research conducted in different areas of the country (especially those where the obesity problem is more pronounced) might produce greater differences than that which was measured on the CU campus. Future studies could also examine the effects of health information on different age groups, as well as in an actual restaurant setting, with the possibility of tracking consumption behavior in addition to ordering behavior. As these studies were conducted using only college students, the external validity and ability to generalize to other groups is questionable and future experiments should explore possible effects on a wider age and socioeconomic group.

Future research could measure participants' level of nutritional education and understanding, and even incorporate a second independent variable into a factorial design measuring the possible influence of both a program of nutritional education and the availability of caloric information included with menus on ordering behavior. The ability to understand the context of a daily recommended intake of calories in addition to available caloric information

provided when ordering may decrease the total number of calories ordered and increase healthy eating behavior. Thus, although the results of these studies were not as predicted, and there were several limitations and alternative explanations, this research still proposes interesting questions for future work in this field

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## Appendix

Figure 1:

## Average Number of Calories Ordered by Menu Type

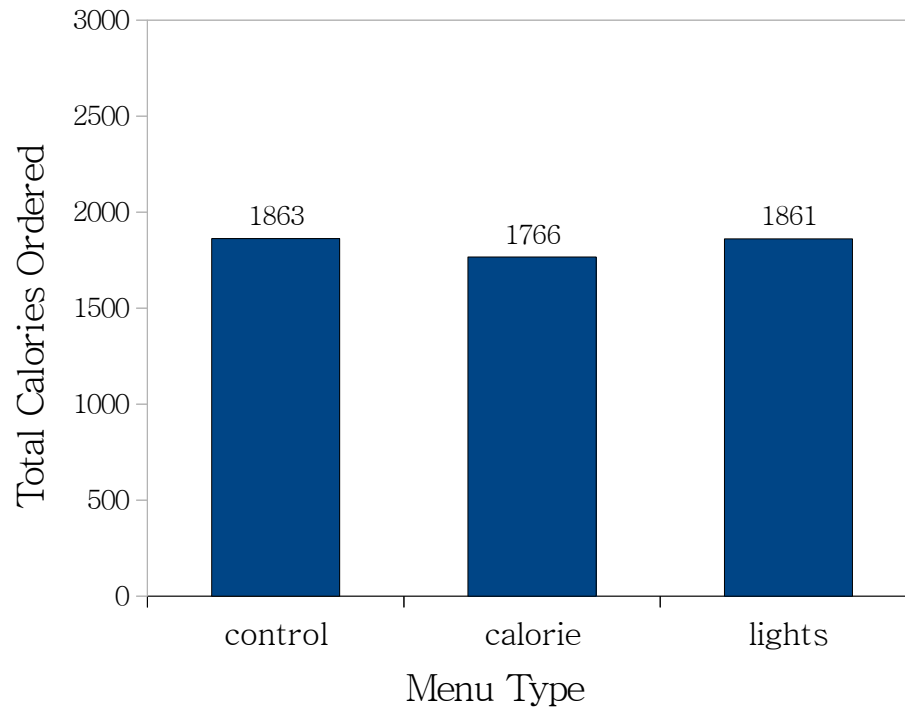


Figure 2:

## Menu by Gender Interaction Trend

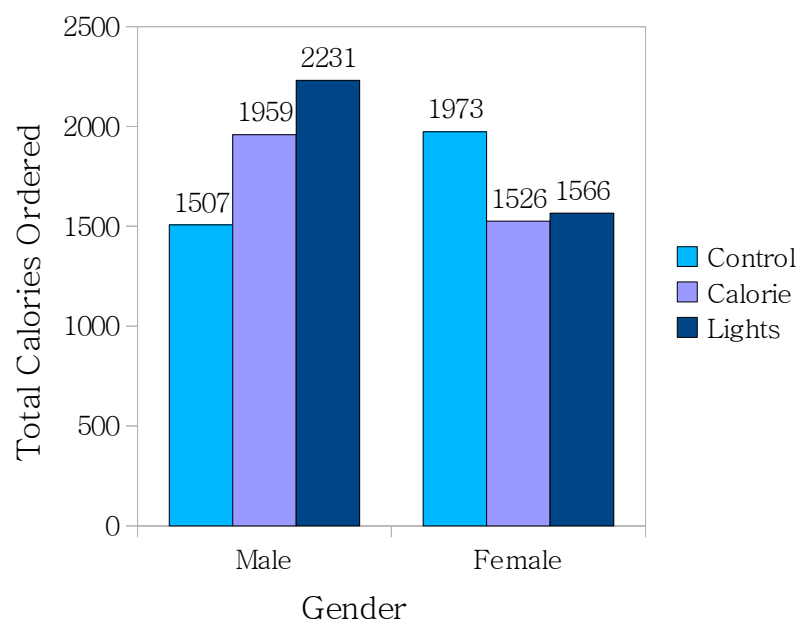


Figure 3:

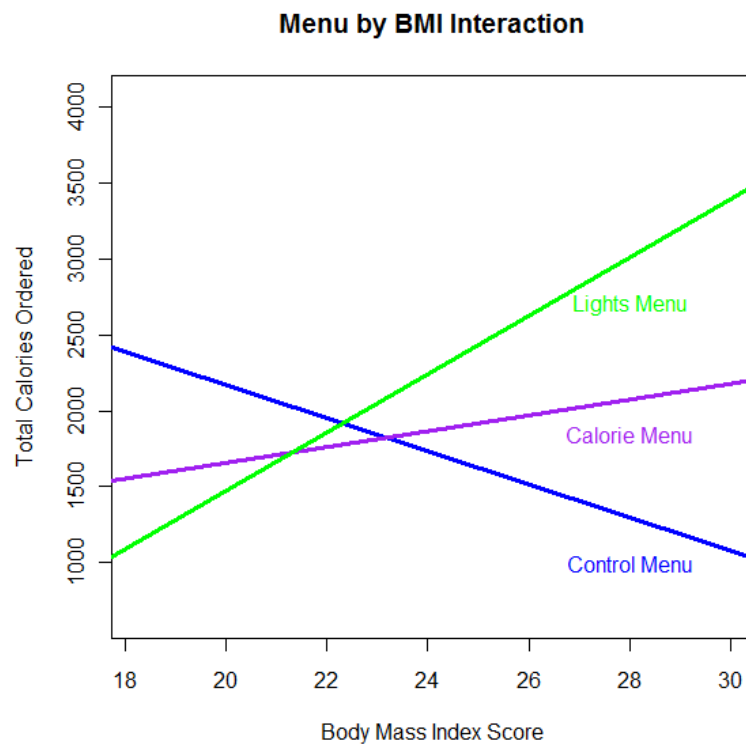


Figure 4:



Figure 5:

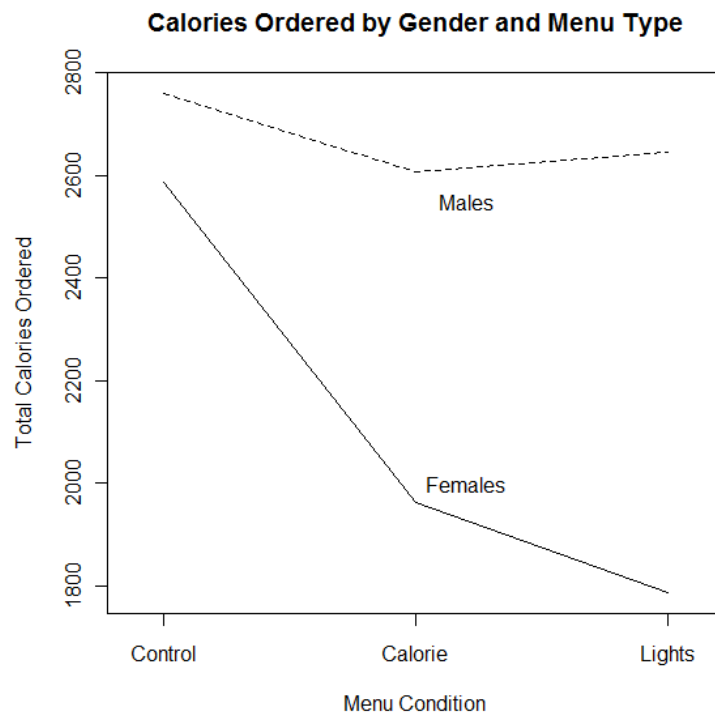


Figure 6:





Figure 7:

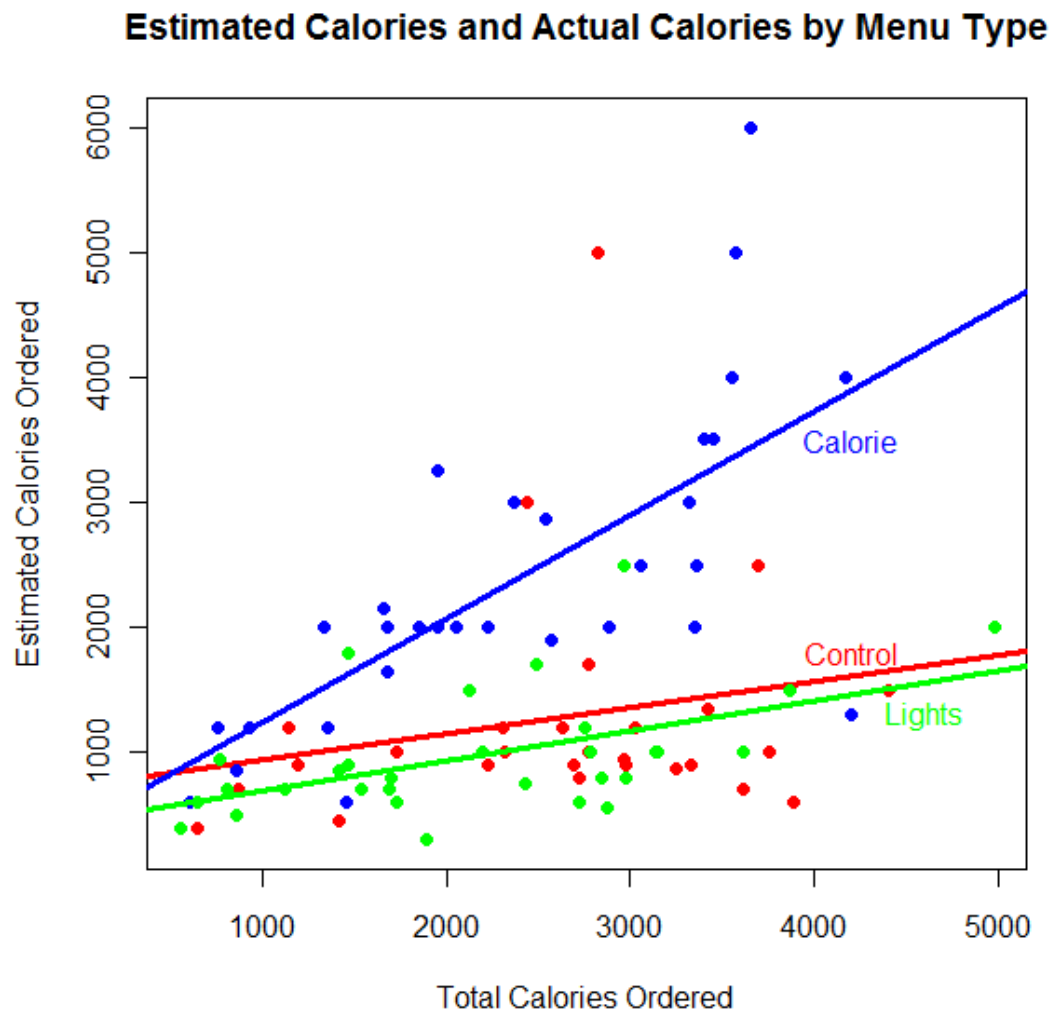


Figure 8:



Figure 9:

